

Syllabus

Motion and Forces in CAPS (Cars, Amusement Parks & Sports)

Instructors:

Arthur Eisenkraft, Professor, UMASS Boston

arthur.eisenkraft@umb.edu

Office: Wheatley (4th floor – 4-181: between the orange lockers)

Phone: 617.287.7652

Co-Instructors:

"Catherine Haberkorn" <chaberkorn@gmail.com>, Medford HS

Dates of Course: Jan 29; Feb 5, 12, 26; Mar 5, 12, 19; 23 Apr 2, 9, 23, 30; May 7, 14, 18

Note that March 23 and May 18 are Saturdays.

Evening meetings are scheduled 4:00 – 7:30. Saturdays are 9:00 – 3:30

Office hours: One hour before and after each course meeting and by appointment

Catalog Description: Motion and Forces in CAPS (Cars, Amusement Parks & Sports)

Motion and Forces are major organizing principles of science and their understanding led to the Newtonian revolution. This is a contextualized content graduate level course offered to provide pre- and in-service teachers with the in-depth knowledge of motion and forces that is necessary for effective science instruction in K-12 classes. This class will include content in motion, forces, momentum and energy that will allow us to better appreciate amusement park rides, sports and safe driving. Each topic will be “contextualized” with the *Active Physics* curriculum that is used in many districts. In addition, there will be opportunities for laboratory investigations, historical and philosophical insights into the content as well as reflections and discussions on the best way to communicate this content to K-12 students given their backgrounds and the misconceptions research insights. There are no prerequisites for taking the course and it is open to all elementary, middle and high school teachers. The format of the course will also provide insights into the value of project based learning, a 7E instructional model and the new Framework and Next Generation Science Standards (NGSS).

Objectives of the Course

Enduring understandings

- The world is orderly and comprehensible
- Four Essential Questions and how they apply to all science learning and instruction
 - What does it mean?
 - How do we know?
 - Why do we believe?
 - Why should I care?
- There are a few BIG ideas in physics and a few COMMON themes of all science
- There are multiple models for describing events and phenomena
 - Verbal
 - Qualitative
 - Mathematical
 - Graphical
 - Pictures

Course Content

- Reaction time measurements
- Speed and acceleration
- Graphing motion

Syllabus

Motion and Forces in CAPS (Cars, Amusement Parks & Sports)

- Model building
- Newton's laws
- Projectiles
- Friction
- Conservation of energy
- Gravity
- Work and Power

Projects: Teams will work on the following project challenges

- Demonstrate your knowledge of safe driving to a board of driving instructors
- Create a voice-over for a sports clip explaining the science of the sporting event
- Modify or design a roller coaster to meet the needs of a specific group of riders

Prerequisites

None

Required Texts (provided for use during course)

Eisenkraft, Active Physics: Third Edition, 2009

Huggins, Physics 2000 – non-calculus

Eisenkraft. Quantoons. 2006.

Grading Policies

Grades will be determined by a combination of weekly assignments, participation, tests and the final project.

- | | |
|---|-----------|
| • Class discussion/attendance/participation | 15 points |
| • Homeworks | 20 points |
| • Group projects | 15 points |
| • Tests (3) | 30 points |
| • Final Project/Exam | 20 points |